Sharine Rowe Final

Subject: Living Environment

Grade: 9

Topic: Energy and Water – Experimenting with Photosynthesis

Objectives:

* Students will be able to utilize given materials to portray photosynthesis.
* Students will be able to investigate how different conditions (variables) can affect the rate of photosynthesis.
* Students will be able to communicate their understandings in a formal lab report

Living Environment Performance Standards:

Key Idea 6: Plants and animals depend on each other and their physical environment. Students provide evidence that green plants make food and explain the significance of this process to other organisms

Teacher Competency: 3c- Engage students in learning

Background:

In a previous lesson, students studied how plants captured the sun’s energy in organic molecules in a process called photosynthesis. In this lesson, they will see photosynthesis in action, using an elodea plant. They will then manipulate the rate of photosynthesis by varying conditions within the setup.

Materials: test tube, Elodea cuttings, sodium bicarbonate (baking soda), beaker with water, lamp

**Part 1: Measurement of Photosynthesis**

There are various set-ups that can be used to measure the rate of photosynthesis. Each relies on counting the oxygen produced during the reaction. To improve results, add a pinch of baking soda to the water in the test tube. Cut elodea stems at an angle and use your fingers to crush the end of the stem. The water in the beaker is meant to absorb the heat from the light.

If you do not see bubbles right away, re-cut and crush the stems, experiment with moving the light closer to the apparatus. Your goal is to find a way to consistently measure the rate of photosynthesis using any of the designs above.

**Part 2: Conditions for Photosynthesis**

1. With the members of your group, brainstorm variables that may affect the rates of photosynthesis.
2. Form a hypothesis to test your variable.
3. Design an experiment to test your hypothesis. (check with instructor about available materials)
4. After discussing your plan with your instructor, perform your experiment.
5. Record all data and determine if your data supports or refutes your hypothesis.

**Lab Report Template**

Title: \* a brief, concise, yet descriptive title

Statement of the Problem:

\* What question(s) are you trying to answer?  \* Include any preliminary observations or background information about the subject

Hypothesis:

\* Write a possible solution for the problem. \* Make sure this possible solution is a complete sentence. \* Make sure the statement is testable, an if-then statement is recommended to illustrate what criteria will support your hypothesis (and what data would no support the hypothesis).

Materials:

\* Make a list of ALL items used in the lab. Alternatively, materials can be included as part of the procedure.

Procedure:

\* Write a paragraph (complete sentences) which explains what you did in the lab as a short summary. \* Add details (step-by-step) of your procedure in such a way that anyone else could repeat the experiment.

Results (Data):

\* This section should include any data tables, observations, or additional notes you make during the lab.  \* You may attach a separate sheet(s) if necessary. \* All tables, graphs and charts should be labeled appropriately.

Conclusions:

* Accept or reject your hypothesis. \* EXPLAIN why you accepted or rejected your hypothesis using data from the lab. \* Include a summary of the data - averages, highest, lowest..etc to help the reader understand your results. Try not to copy your data here, you should summarize and reference KEY information. \* List one thing you learned and describe how it applies to a real-life situation.  \*Discuss possible errors that could have occurred in the collection of the data (experimental errors)

Lab Report Grading Rubric:

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| --- | --- | --- | --- | --- |
|  | Excellent (4 pts) | Good (3 pts) | Adequate (2 pts) | Needs Work (1 pt) |
| **Introduction** | 1. Includes the question to be answered by the lab  2. states hypothesis that is based on research and/or sound reasoning  3. title is relevant. | One of the "excellent" conditions is not met, two conditions met | Two of the "excellent" conditions is not met , one is met | Introduction present, no exemplary conditions met |
| **Methods** | Description or step-by-step process is included, could be repeated by another scientist | Description included, some steps are vague or unclear | The description gives generalities, enough for reader to understand how the experiment was conducted | Would be difficult to repeat, reader must guess at how the data was gathered or experiment conducted |
| **Data and Analysis** | Results and data are clearly recorded, organized so it is easy for the reader to see trends. All appropriate labels are included | Results are clear and labeled, trends are not obvious or there are minor errors in organization | Results are unclear, missing labels, trends are not obvious, disorganized, there is enough data to show the experiment was conducted | Results are disorganized or poorly recorded, do not make sense ; not enough data was taken to justify results |
| **Conclusions** | 1. Summarizes data used to draw conclusions  2. Conclusions follow data (not wild guesses or leaps of logic),  3. Discusses applications or real world connections  4. Hypothesis is rejected or accepted based on the data. | 3 of 4 of the "excellent" conditions is met | 2 of the 4 excellent conditions met | 1 of the 4 excellent conditions met |
| **Format and Lab Protocols** | Lab report submitted as directed, and on time. Directions were followed, stations were cleaned. All safety protocols followed. | Most of the excellent conditions were met; possible minor errors in format or procedures | Some of the excellent conditions met, directions were not explicitly followed, lab stations may have been left unclean or group not practicing good safety (such as not wearing goggles) | Student did not follow directions, practiced unsafe procedures, goofed around in the lab, left a mess or equipment lost |
|  | Total (out of 20 ) | | | |